

```
In [44]: # importing the required libraries
import os
import numpy as np
import pandas as pd
```

```
In [45]: os.getcwd()
```

```
Out[45]: 'd:\\DATA_S\\Python\\Black Friday'
```

```
In [46]: # read the CSV file, to load the data-set
df=pd.read_csv("blackfriday.csv")
```

```
In [47]: # shape of the dataframe
df.shape
```

```
Out[47]: (550068, 12)
```

```
In [48]: # checking dimension
df.ndim
```

```
Out[48]: 2
```

```
In [49]: #checking 1st 10 row
df.head(10)
```

```
Out[49]:
```

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_
0	1000001	P00069042	F	0-17	10	A	
1	1000001	P00248942	F	0-17	10	A	
2	1000001	P00087842	F	0-17	10	A	
3	1000001	P00085442	F	0-17	10	A	
4	1000002	P00285442	M	55+	16	C	
5	1000003	P00193542	M	26-35	15	A	
6	1000004	P00184942	M	46-50	7	B	
7	1000004	P00346142	M	46-50	7	B	
8	1000004	P0097242	M	46-50	7	B	
9	1000005	P00274942	M	26-35	20	A	

In [50]: *#checking the last 10 rows*  
`df.tail(10)`

Out[50]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
<b>550058</b>	1006024	P00372445	M	26-35	12	A	
<b>550059</b>	1006025	P00370853	F	26-35	1	B	
<b>550060</b>	1006026	P00371644	M	36-45	6	C	
<b>550061</b>	1006029	P00372445	F	26-35	1	C	
<b>550062</b>	1006032	P00372445	M	46-50	7	A	
<b>550063</b>	1006033	P00372445	M	51-55	13	B	
<b>550064</b>	1006035	P00375436	F	26-35	1	C	
<b>550065</b>	1006036	P00375436	F	26-35	15	B	
<b>550066</b>	1006038	P00375436	F	55+	1	C	
<b>550067</b>	1006039	P00371644	F	46-50	0	B	

◀ ▶

In [51]: *#checking for duplicates or total no. of duplicate rows*  
`sum(df.duplicated())`

Out[51]: 0

*Creating a new Datasets with all product related columns*

In [52]: *#checking the columns present in the dataframe*  
`df.columns`

Out[52]: Index(['User\_ID', 'Product\_ID', 'Gender', 'Age', 'Occupation', 'City\_Category', 'Stay\_In\_Current\_City\_Years', 'Marital\_Status', 'Product\_Category\_1', 'Product\_Category\_2', 'Product\_Category\_3', 'Purchase'], dtype='object')

In [53]: *#product related columns*  
`[i for i in df.columns if 'Product' in i]`

Out[53]: ['Product\_ID',  
'Product\_Category\_1',  
'Product\_Category\_2',  
'Product\_Category\_3']

**creating another dataset which will be a subset of the original and will have columns realted to products**

```
In [54]: #creating product related dataframe
df_product= df[['Product_ID', 'Product_Category_1', 'Product_Category_2', 'Product_
```

```
In [55]: df_product
```

```
Out[55]:
```

	Product_ID	Product_Category_1	Product_Category_2	Product_Category_3
0	P00069042	3	NaN	NaN
1	P00248942	1	6.0	14.0
2	P00087842	12	NaN	NaN
3	P00085442	12	14.0	NaN
4	P00285442	8	NaN	NaN
...	...	...	...	...
550063	P00372445	20	NaN	NaN
550064	P00375436	20	NaN	NaN
550065	P00375436	20	NaN	NaN
550066	P00375436	20	NaN	NaN
550067	P00371644	20	NaN	NaN

550068 rows × 4 columns

```
In [56]: #using info function to figure out missing or null values
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 550068 entries, 0 to 550067
Data columns (total 12 columns):
#   Column                                Non-Null Count  Dtype
---  -
0   User_ID                               550068 non-null  int64
1   Product_ID                           550068 non-null  object
2   Gender                               550068 non-null  object
3   Age                                   550068 non-null  object
4   Occupation                           550068 non-null  int64
5   City_Category                        550068 non-null  object
6   Stay_In_Current_City_Years          550068 non-null  object
7   Marital_Status                      550068 non-null  int64
8   Product_Category_1                  550068 non-null  int64
9   Product_Category_2                  376430 non-null  float64
10  Product_Category_3                  166821 non-null  float64
11  Purchase                             550068 non-null  int64
dtypes: float64(2), int64(5), object(5)
memory usage: 50.4+ MB
```

## DESCRIPTIVE STATISTICS

In [57]: `df.describe()`

Out[57]:

	User_ID	Occupation	Marital_Status	Product_Category_1	Product_Category_2
<b>count</b>	5.500680e+05	550068.000000	550068.000000	550068.000000	376430.000000
<b>mean</b>	1.003029e+06	8.076707	0.409653	5.404270	9.840100
<b>std</b>	1.727592e+03	6.522660	0.491770	3.936211	5.060100
<b>min</b>	1.000001e+06	0.000000	0.000000	1.000000	2.000000
<b>25%</b>	1.001516e+06	2.000000	0.000000	1.000000	5.000000
<b>50%</b>	1.003077e+06	7.000000	0.000000	5.000000	9.000000
<b>75%</b>	1.004478e+06	14.000000	1.000000	8.000000	15.000000
<b>max</b>	1.006040e+06	20.000000	1.000000	20.000000	18.000000

In [58]: `# descriptive stat for object datatype`  
`df.describe(include=[object])`

Out[58]:

	Product_ID	Gender	Age	City_Category	Stay_In_Current_City_Years
<b>count</b>	550068	550068	550068	550068	550068
<b>unique</b>	3631	2	7	3	5
<b>top</b>	P00265242	M	26-35	B	1
<b>freq</b>	1880	414259	219587	231173	193821

**% distribution of each product ID available in dataset and find the highest occurring product\_ID in the Dataset**

In [59]: `# NUMBER OF TIMES A PRODUCT WAS PURCHASED`  
`df['Product_ID'].value_counts()`

Out[59]:

```

Product_ID
P00265242    1880
P00025442    1615
P00110742    1612
P00112142    1562
P00057642    1470
...
P00314842     1
P00298842     1
P00231642     1
P00204442     1
P00066342     1
Name: count, Length: 3631, dtype: int64

```

In [60]: `# converting the above in percentage`  
`round(df['Product_ID'].value_counts(normalize=True)*100,3)`

```
Out[60]: Product_ID
P00265242    0.342
P00025442    0.294
P00110742    0.293
P00112142    0.284
P00057642    0.267
...
P00314842    0.000
P00298842    0.000
P00231642    0.000
P00204442    0.000
P00066342    0.000
Name: proportion, Length: 3631, dtype: float64
```

*product id with P0026524 has the highest percentage this implies its purchased more by the customers..*

## HANDLING MISSING VALUES

```
In [61]: #count of null values
df.isnull().sum()
```

```
Out[61]: User_ID                0
Product_ID                0
Gender                    0
Age                      0
Occupation                0
City_Category            0
Stay_In_Current_City_Years  0
Marital_Status           0
Product_Category_1        0
Product_Category_2       173638
Product_Category_3       383247
Purchase                  0
dtype: int64
```

```
In [62]: #Analysing the Product_Category_3 & 2 columns
df.Product_Category_2
```

```
Cell In[62], line 2
df.Product_Category_2
^
```

**IndentationError:** unexpected indent

```
In [ ]: df.Product_Category_3
```

```
Out[ ]: 0      NaN
1      14.0
2      NaN
3      NaN
4      NaN
...
550063  NaN
550064  NaN
550065  NaN
550066  NaN
550067  NaN
Name: Product_Category_3, Length: 550068, dtype: float64
```

```
In [ ]: #dropping Product_Category_2
df_temp= df.drop('Product_Category_2',axis=1,inplace=False)
```

```
In [ ]: df_temp.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 550068 entries, 0 to 550067
Data columns (total 11 columns):
#   Column                                Non-Null Count  Dtype
---  -
0   User_ID                               550068 non-null  int64
1   Product_ID                            550068 non-null  object
2   Gender                                550068 non-null  object
3   Age                                    550068 non-null  object
4   Occupation                            550068 non-null  int64
5   City_Category                         550068 non-null  object
6   Stay_In_Current_City_Years           550068 non-null  object
7   Marital_Status                        550068 non-null  int64
8   Product_Category_1                    550068 non-null  int64
9   Product_Category_3                    166821 non-null  float64
10  Purchase                              550068 non-null  int64
dtypes: float64(1), int64(5), object(5)
memory usage: 46.2+ MB
```

```
In [ ]: #get index for all the rows of Product_Category_3 missing values
df_temp[df_temp.Product_Category_3.isnull()].index
```

```
Out[ ]: Index([    0,    2,    3,    4,    5,    7,    8,    9,   10,
              11,
              ...
              550058, 550059, 550060, 550061, 550062, 550063, 550064, 550065, 550066,
              550067],
              dtype='int64', length=383247)
```

```
In [ ]: df_temp= df_temp.drop(df_temp[df_temp.Product_Category_3.isnull()].index,axis=0,
```

```
In [ ]: df_temp.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 166821 entries, 1 to 545914
Data columns (total 11 columns):
#   Column                                Non-Null Count  Dtype
---  -
0   User_ID                               166821 non-null  int64
1   Product_ID                            166821 non-null  object
2   Gender                                166821 non-null  object
3   Age                                    166821 non-null  object
4   Occupation                            166821 non-null  int64
5   City_Category                         166821 non-null  object
6   Stay_In_Current_City_Years           166821 non-null  object
7   Marital_Status                        166821 non-null  int64
8   Product_Category_1                    166821 non-null  int64
9   Product_Category_3                    166821 non-null  float64
10  Purchase                              166821 non-null  int64
dtypes: float64(1), int64(5), object(5)
memory usage: 15.3+ MB
```

*Dropped Product\_Category\_2 completely & Product\_Category\_3 we dropped the missing values based on rows this entire process resulted in all the columns having equal values*

Next , we try to Handle The missing values in Data frame df again using the imputting techniques such as mean/median/mode/ffill/bfill..

```
In [ ]: #impute using forward filling  
df= df.ffill()
```

```
In [ ]: df.isnull().sum()
```

```
Out[ ]: User_ID          0  
Product_ID          0  
Gender              0  
Age                 0  
Occupation          0  
City_Category       0  
Stay_In_Current_City_Years  0  
Marital_Status      0  
Product_Category_1  0  
Product_Category_2  0  
Product_Category_3  0  
Purchase            0  
dtype: int64
```

```
In [ ]: #impute using Backward filling  
df= df.bfill()
```

```
In [ ]: df.isnull().sum()
```

```
Out[ ]: User_ID          0  
Product_ID          0  
Gender              0  
Age                 0  
Occupation          0  
City_Category       0  
Stay_In_Current_City_Years  0  
Marital_Status      0  
Product_Category_1  0  
Product_Category_2  0  
Product_Category_3  0  
Purchase            0  
dtype: int64
```

### Indexing and slicing using pandas

print age and occupation columns using LOC and select 1st, 5th & 10th rows with 1st, 4th and 7th columns using iloc

here we will see how to slice and dice the data and get the subset of the pandas dataframe

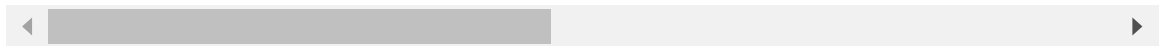
```
In [63]: # make a copy of the dataframe  
df1= df.copy()
```

```
In [64]: df1
```

Out[64]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
0	1000001	P00069042	F	0-17	10	A	
1	1000001	P00248942	F	0-17	10	A	
2	1000001	P00087842	F	0-17	10	A	
3	1000001	P00085442	F	0-17	10	A	
4	1000002	P00285442	M	55+	16	C	
...	...	...	...	...	...	...	...
550063	1006033	P00372445	M	51-55	13	B	
550064	1006035	P00375436	F	26-35	1	C	
550065	1006036	P00375436	F	26-35	15	B	
550066	1006038	P00375436	F	55+	1	C	
550067	1006039	P00371644	F	46-50	0	B	

550068 rows × 12 columns



```
In [ ]: # select 1st row of dataframe using LOC
df1.loc[0]
```

```
Out [ ]: User_ID          1000001
Product_ID        P00069042
Gender            F
Age              0-17
Occupation        10
City_Category     A
Stay_In_Current_City_Years  2
Marital_Status    0
Product_Category_1  3
Product_Category_2  NaN
Product_Category_3  NaN
Purchase          8370
Name: 0, dtype: object
```

```
In [ ]: #1st and product ID
df1.loc[0, 'Product_ID']
```

```
Out [ ]: 'P00069042'
```

```
In [ ]: # printing purchase for all the rows
df1.loc[:, 'Purchase']
```



```
Out[ ]: 0      8370
        1     15200
        2      1422
        3      1057
        4      7969
        ...
        550063    368
        550064    371
        550065    137
        550066    365
        550067    490
Name: Purchase, Length: 550068, dtype: int64
```

```
In [ ]: # printing top 10 rows for purchase
df1.loc[:10, 'Purchase']
```

```
Out[ ]: 0      8370
        1     15200
        2      1422
        3      1057
        4      7969
        5     15227
        6     19215
        7     15854
        8     15686
        9      7871
       10     5254
Name: Purchase, dtype: int64
```

```
In [ ]: # print the age and occupation
df1.loc[:, ['Age', 'Occupation']]
```

```
Out[ ]:
```

	Age	Occupation
0	0-17	10
1	0-17	10
2	0-17	10
3	0-17	10
4	55+	16
...	...	...
550063	51-55	13
550064	26-35	1
550065	26-35	15
550066	55+	1
550067	46-50	0

550068 rows × 2 columns

```
In [ ]: # printing the 1st 5 rows of age and occupation
df1.loc[[0,1,2,3,4,5], ['Age', 'Occupation']]
```

Out[ ]: **Age Occupation**

<b>0</b>	0-17	10
<b>1</b>	0-17	10
<b>2</b>	0-17	10
<b>3</b>	0-17	10
<b>4</b>	55+	16
<b>5</b>	26-35	15

In [ ]: *# doing the same as above*  
`df1.loc[:,['Age','Occupation']].head()`

Out[ ]: **Age Occupation**

<b>0</b>	0-17	10
<b>1</b>	0-17	10
<b>2</b>	0-17	10
<b>3</b>	0-17	10
<b>4</b>	55+	16

In [ ]: *# printing all the columns for 2nd ,3rd and 4th rows*  
`df1.loc[2:4]`

Out[ ]: **User\_ID Product\_ID Gender Age Occupation City\_Category Stay\_In\_Current\_City\_**

<b>2</b>	1000001	P00087842	F	0-17	10	A
<b>3</b>	1000001	P00085442	F	0-17	10	A
<b>4</b>	1000002	P00285442	M	55+	16	C



In [ ]: *# printing the 1st row of the dataframe using iloc*  
`df1.iloc[0]`

Out[ ]: User\_ID 1000001  
 Product\_ID P00069042  
 Gender F  
 Age 0-17  
 Occupation 10  
 City\_Category A  
 Stay\_In\_Current\_City\_Years 2  
 Marital\_Status 0  
 Product\_Category\_1 3  
 Product\_Category\_2 NaN  
 Product\_Category\_3 NaN  
 Purchase 8370  
 Name: 0, dtype: object

```
In [ ]: #the last of the dataframe
df1.iloc[-1]
```

```
Out[ ]: User_ID          1006039
Product_ID        P00371644
Gender            F
Age              46-50
Occupation        0
City_Category     B
Stay_In_Current_City_Years  4+
Marital_Status    1
Product_Category_1  20
Product_Category_2  NaN
Product_Category_3  NaN
Purchase          490
Name: 550067, dtype: object
```

```
In [ ]: # 1st 5columns of the dataframe with all rows using iloc
df1.iloc[:, :5]
```

```
Out[ ]:
```

	User_ID	Product_ID	Gender	Age	Occupation
0	1000001	P00069042	F	0-17	10
1	1000001	P00248942	F	0-17	10
2	1000001	P00087842	F	0-17	10
3	1000001	P00085442	F	0-17	10
4	1000002	P00285442	M	55+	16
...	...	...	...	...	...
550063	1006033	P00372445	M	51-55	13
550064	1006035	P00375436	F	26-35	1
550065	1006036	P00375436	F	26-35	15
550066	1006038	P00375436	F	55+	1
550067	1006039	P00371644	F	46-50	0

550068 rows × 5 columns

```
In [ ]: #select 1st ,5th and 10th rows with 1st , 4th and 7th columns using Lioc
df1.iloc[[0,4,9],[0,3,6]]
```

```
Out[ ]:
```

	User_ID	Age	Stay_In_Current_City_Years
0	1000001	0-17	2
4	1000002	55+	4+
9	1000005	26-35	1

**Now we fetch row having maximum purchase amountwith completerow details**

pandas provide two functions idmax() & idmin() that return index of 1st occurence of

maximum or minimum values over requested axis. NULL values are excluded from the out-put

```
In [ ]: # index of 1st occurrence of maximum value of purchase column
df1['Purchase'].idxmax()
```

```
Out[ ]: 87440
```

```
In [ ]: # maximum value of the purchase column
df1.Purchase[df1['Purchase'].idxmax()]
```

```
Out[ ]: 23961
```

```
In [ ]: #row with maximum purchase value
df1[df1['Purchase']==23961]
```

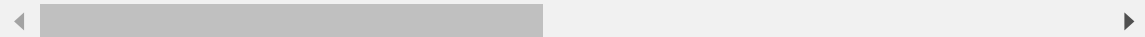
```
Out[ ]:
```

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
--	---------	------------	--------	-----	------------	---------------	-----------------

<b>87440</b>	1001474	P00052842	M	26-35	4	A	
--------------	---------	-----------	---	-------	---	---	--

<b>93016</b>	1002272	P00052842	M	26-35	0	C	
--------------	---------	-----------	---	-------	---	---	--

<b>370891</b>	1003160	P00052842	M	26-35	17	C	
---------------	---------	-----------	---	-------	----	---	--



### GET PURCHASE AMOUNT FROM 3RD ROW

Pandas also provide at() and iat() function to access single value for a row and column pair by label or integer position

```
In [ ]: # get value at the 3rd row and purchase column pair
df1.at[2, 'Purchase']
```

```
Out[ ]: 1422
```

```
In [ ]: df1.head()
```

```
Out[ ]:
```

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_'
--	---------	------------	--------	-----	------------	---------------	------------------------

<b>0</b>	1000001	P00069042	F	0-17	10	A	
----------	---------	-----------	---	------	----	---	--

<b>1</b>	1000001	P00248942	F	0-17	10	A	
----------	---------	-----------	---	------	----	---	--

<b>2</b>	1000001	P00087842	F	0-17	10	A	
----------	---------	-----------	---	------	----	---	--

<b>3</b>	1000001	P00085442	F	0-17	10	A	
----------	---------	-----------	---	------	----	---	--

<b>4</b>	1000002	P00285442	M	55+	16	C	
----------	---------	-----------	---	-----	----	---	--



```
In [ ]: #3rd row and 11th column pair
df1.at[2, 'Product_Category_3']
```

```
Out[ ]: nan
```

```
In [ ]: # doing the same as above but using iat
df1.iat[2,10]
```

```
Out[ ]: nan
```

```
In [ ]: # finding the purchase amount for user_id 1006039 and product_id P00371644
df.loc[((df1['User_ID']==1006039) & (df1['Product_ID'] == 'P00371644')), 'Purchas
```

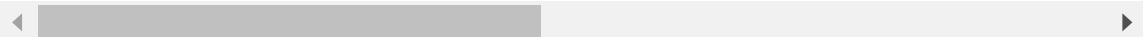
```
Out[ ]: 550067    490
Name: Purchase, dtype: int64
```

```
In [ ]: # checking for the above, 550067 is the index of 490 (purchace amount)
df1.loc[550067 :]
```

```
Out[ ]:
```

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
--	---------	------------	--------	-----	------------	---------------	-----------------

550067	1006039	P00371644	F	46-50	0	B	
--------	---------	-----------	---	-------	---	---	--



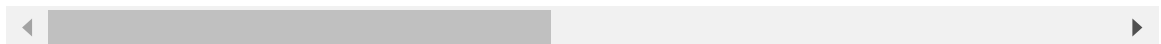
**FIND THE USERS IN CITY A WITH MORE THAN 4YRS AND PURCHASE AMOUNT MORE THAN 1000**

```
In [ ]: # purchase amount wit given user_id & product_id
df1[(df1['City_Category']== 'A') & (df1['Stay_In_Current_City_Years']=='4+') & (
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
<b>98</b>	1000022	P00351142	M	18-25	15	A	
<b>100</b>	1000022	P00195942	M	18-25	15	A	
<b>102</b>	1000022	P0098242	M	18-25	15	A	
<b>103</b>	1000022	P00262242	M	18-25	15	A	
<b>416</b>	1000073	P00351142	M	18-25	4	A	
...	...	...	...	...	...	...	...
<b>545791</b>	1006019	P00279442	M	26-35	0	A	
<b>545792</b>	1006019	P00262342	M	26-35	0	A	
<b>545793</b>	1006019	P00028842	M	26-35	0	A	
<b>545794</b>	1006019	P00070342	M	26-35	0	A	
<b>545832</b>	1006028	P0097242	M	18-25	4	A	

6947 rows × 12 columns



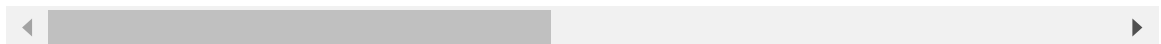
**discard all the users of city B with purchase less than 5000 and 3yrs time period**

```
In [ ]: #get the purchase with given user_id and the product_id
df1[(~(df1['Gender']=='F')) & (df1['City_Category']=='B') & (df1['Stay_In_Current
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
<b>112</b>	1000023	P00278942	M	36-45	0	B	
<b>113</b>	1000023	P00004742	M	36-45	0	B	
<b>114</b>	1000023	P00198042	M	36-45	0	B	
<b>115</b>	1000023	P00177442	M	36-45	0	B	
<b>116</b>	1000023	P00000642	M	36-45	0	B	
...	...	...	...	...	...	...	...
<b>549883</b>	1005776	P00371644	M	18-25	12	B	
<b>549903</b>	1005801	P00370853	M	26-35	16	B	
<b>549909</b>	1005811	P00375436	M	18-25	4	B	
<b>549933</b>	1005849	P00370293	M	36-45	17	B	
<b>549945</b>	1005868	P00370853	M	36-45	14	B	

31853 rows × 12 columns

**FIND THE RECORD OF THE DATA SET BELEOW**

[1006038,'P00375436','F','55+', '1','C','2','0',20,2.0,11.0,365]

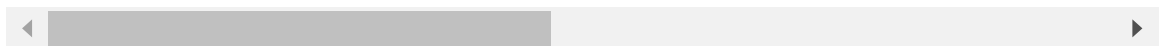
In [ ]:

```
# we will use isin() to slove the above
values = ['1006038','P00375436','F','55+', '1','C','2','0',20,2.0,11.0,365]
df1_indexed= df1.isin(values)
df1_indexed
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
0	False	False	True	False	False	False	
1	False	False	True	False	False	False	
2	False	False	True	False	False	False	
3	False	False	True	False	False	False	
4	False	False	False	True	False	True	
...	...	...	...	...	...	...	
550063	False	False	False	False	False	False	
550064	False	True	True	False	False	True	
550065	False	True	True	False	False	False	
550066	False	True	True	True	False	True	
550067	False	False	True	False	False	False	

550068 rows × 12 columns



In [ ]: *# now we use all condition to find the columns for the given Data set*  
`df1_indexed = df1.isin(values).all(axis=1)`  
`df1[df1_indexed]`

Out[ ]: **User\_ID Product\_ID Gender Age Occupation City\_Category Stay\_In\_Current\_City\_Ye**



In [ ]: *# use mask function to get only the rows with occupation 10*  
`new_df = df1.mask(df1['Occupation']!=10)`  
`new_df.head(10)`



Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City
--	---------	------------	--------	-----	------------	---------------	----------------------

0	1000001.0	P00069042	F	0-17	10.0	A	
---	-----------	-----------	---	------	------	---	--

1	1000001.0	P00248942	F	0-17	10.0	A	
---	-----------	-----------	---	------	------	---	--

2	1000001.0	P00087842	F	0-17	10.0	A	
---	-----------	-----------	---	------	------	---	--

3	1000001.0	P00085442	F	0-17	10.0	A	
---	-----------	-----------	---	------	------	---	--

4	NaN	NaN	NaN	NaN	NaN	NaN	
---	-----	-----	-----	-----	-----	-----	--

5	NaN	NaN	NaN	NaN	NaN	NaN	
---	-----	-----	-----	-----	-----	-----	--

6	NaN	NaN	NaN	NaN	NaN	NaN	
---	-----	-----	-----	-----	-----	-----	--

7	NaN	NaN	NaN	NaN	NaN	NaN	
---	-----	-----	-----	-----	-----	-----	--

8	NaN	NaN	NaN	NaN	NaN	NaN	
---	-----	-----	-----	-----	-----	-----	--

9	NaN	NaN	NaN	NaN	NaN	NaN	
---	-----	-----	-----	-----	-----	-----	--



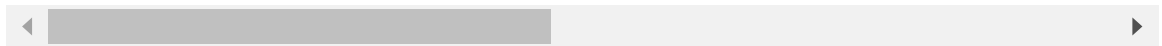
In [ ]:

```
# sort the dataset row wise  
# via default sort is row-wise  
df1.sort_index()
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
<b>0</b>	1000001	P00069042	F	0-17	10	A	
<b>1</b>	1000001	P00248942	F	0-17	10	A	
<b>2</b>	1000001	P00087842	F	0-17	10	A	
<b>3</b>	1000001	P00085442	F	0-17	10	A	
<b>4</b>	1000002	P00285442	M	55+	16	C	
...	...	...	...	...	...	...	...
<b>550063</b>	1006033	P00372445	M	51-55	13	B	
<b>550064</b>	1006035	P00375436	F	26-35	1	C	
<b>550065</b>	1006036	P00375436	F	26-35	15	B	
<b>550066</b>	1006038	P00375436	F	55+	1	C	
<b>550067</b>	1006039	P00371644	F	46-50	0	B	

550068 rows × 12 columns



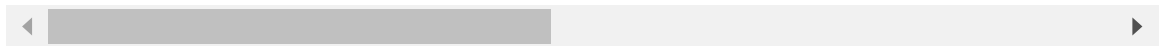
In [ ]:

```
# sort via column
df1.sort_index(axis=1)
```

Out[ ]:

	Age	City_Category	Gender	Marital_Status	Occupation	Product_Category_1
<b>0</b>	0-17	A	F	0	10	3
<b>1</b>	0-17	A	F	0	10	1
<b>2</b>	0-17	A	F	0	10	12
<b>3</b>	0-17	A	F	0	10	12
<b>4</b>	55+	C	M	0	16	8
<b>...</b>	...	...	...	...	...	...
<b>550063</b>	51-55	B	M	1	13	20
<b>550064</b>	26-35	C	F	0	1	20
<b>550065</b>	26-35	B	F	1	15	20
<b>550066</b>	55+	C	F	0	1	20
<b>550067</b>	46-50	B	F	1	0	20

550068 rows × 12 columns



In [ ]:

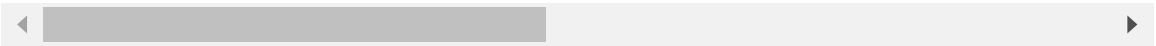
```
# sort row by decending order
df1.sort_index(ascending=False)
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
--	---------	------------	--------	-----	------------	---------------	-----------------

550067	1006039	P00371644	F	46-50	0	B	
550066	1006038	P00375436	F	55+	1	C	
550065	1006036	P00375436	F	26-35	15	B	
550064	1006035	P00375436	F	26-35	1	C	
550063	1006033	P00372445	M	51-55	13	B	
...	...	...	...	...	...	...	...
4	1000002	P00285442	M	55+	16	C	
3	1000001	P00085442	F	0-17	10	A	
2	1000001	P00087842	F	0-17	10	A	
1	1000001	P00248942	F	0-17	10	A	
0	1000001	P00069042	F	0-17	10	A	

550068 rows × 12 columns



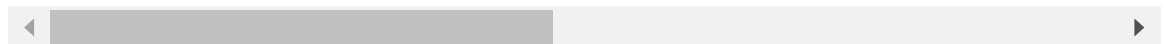
FINDING TOP 20 MOSTREVENUE GENERATED CUSTOMER AND THEIR PURCHASED PRODUCT\_ID

```
In [ ]: #sorting the dataset using purchase column
df1.sort_values(by='Purchase')
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
<b>549221</b>	1004806	P00370293	M	26-35	17	C	
<b>549477</b>	1005184	P00370293	M	18-25	20	B	
<b>547819</b>	1002802	P00370853	M	36-45	20	B	
<b>548027</b>	1003105	P00370853	M	36-45	12	C	
<b>547538</b>	1002402	P00370853	M	46-50	17	B	
...	...	...	...	...	...	...	...
<b>292083</b>	1003045	P00052842	M	46-50	1	B	
<b>503697</b>	1005596	P00117642	M	36-45	12	B	
<b>370891</b>	1003160	P00052842	M	26-35	17	C	
<b>87440</b>	1001474	P00052842	M	26-35	4	A	
<b>93016</b>	1002272	P00052842	M	26-35	0	C	

550068 rows × 12 columns



In [ ]:

```
# sort by purchase and age
df1.sort_values(by=['Purchase', 'Age']).head(5)
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
<b>546045</b>	1000194	P00370853	F	0-17	10	C	
<b>546449</b>	1000775	P00370853	M	0-17	17	C	
<b>550024</b>	1005973	P00370293	M	0-17	10	C	
<b>546301</b>	1000561	P00370853	F	18-25	14	C	
<b>546333</b>	1000608	P00370293	M	18-25	4	C	



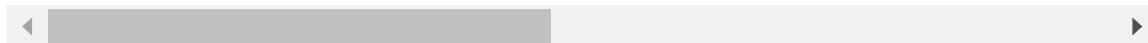
In [ ]:

```
# sorting descending order
df1.sort_values(by='Purchase', ascending=False)
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
<b>370891</b>	1003160	P00052842	M	26-35	17	C	
<b>93016</b>	1002272	P00052842	M	26-35	0	C	
<b>87440</b>	1001474	P00052842	M	26-35	4	A	
<b>503697</b>	1005596	P00117642	M	36-45	12	B	
<b>321782</b>	1001577	P00052842	M	55+	0	C	
...	...	...	...	...	...	...	...
<b>546379</b>	1000671	P00370853	M	18-25	4	C	
<b>546185</b>	1000391	P00370293	M	46-50	11	C	
<b>547032</b>	1001649	P00370293	M	18-25	19	C	
<b>546181</b>	1000387	P00370293	F	36-45	7	C	
<b>549221</b>	1004806	P00370293	M	26-35	17	C	

550068 rows × 12 columns



In [ ]:

```
#3 top 20 using iloc
top20= df1.sort_values(by='Purchase', ascending=False).iloc[:20,:]
```

In [ ]:

top20

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current
<b>370891</b>	1003160	P00052842	M	26-35	17	C	
<b>93016</b>	1002272	P00052842	M	26-35	0	C	
<b>87440</b>	1001474	P00052842	M	26-35	4	A	
<b>503697</b>	1005596	P00117642	M	36-45	12	B	
<b>321782</b>	1001577	P00052842	M	55+	0	C	
<b>349658</b>	1005848	P00119342	M	51-55	20	A	
<b>292083</b>	1003045	P00052842	M	46-50	1	B	
<b>298378</b>	1003947	P00116142	M	26-35	0	C	
<b>437804</b>	1001387	P00086242	F	51-55	13	B	
<b>229329</b>	1005367	P00085342	M	18-25	4	A	
<b>416883</b>	1004117	P00161842	M	18-25	4	B	
<b>7542</b>	1001178	P00116142	M	55+	0	C	
<b>373300</b>	1003511	P00085342	M	51-55	0	C	
<b>33268</b>	1005102	P00052842	M	26-35	12	C	
<b>388010</b>	1005716	P00052842	M	0-17	10	C	
<b>449656</b>	1003301	P00086242	F	26-35	2	B	
<b>366333</b>	1002359	P00085342	M	55+	13	C	
<b>54364</b>	1002274	P00052842	M	18-25	2	B	
<b>56879</b>	1002788	P00085342	M	55+	1	B	
<b>68926</b>	1004520	P00116142	M	26-35	4	C	

In [ ]:

```
# get user_id for this top 20
top20.User_ID.values
```

```
Out[ ]: array([1003160, 1002272, 1001474, 1005596, 1001577, 1005848, 1003045,
              1003947, 1001387, 1005367, 1004117, 1001178, 1003511, 1005102,
              1005716, 1003301, 1002359, 1002274, 1002788, 1004520], dtype=int64)
```

```
In [ ]: # top 20 products
top20.Product_ID.value_counts()
```

```
Out[ ]: Product_ID
P00052842    8
P00085342    4
P00116142    3
P00086242    2
P00117642    1
P00119342    1
P00161842    1
Name: count, dtype: int64
```

### FIND WHICH AGE GROUP IS MORE ACTIVE IN PURCHASING PRODUCT FROM THE WEBSITE

```
In [ ]: #USING UNIQUE TO GET DISTINCT VALUES
df1['Gender'].unique()
```

```
Out[ ]: array(['F', 'M'], dtype=object)
```

```
In [ ]: # count of unique values of the above gender class
df1['Gender'].value_counts()
```

```
Out[ ]: Gender
M      414259
F      135809
Name: count, dtype: int64
```

```
In [ ]: # sort w.r.t count
df1["Gender"].value_counts(ascending=True)
```

```
Out[ ]: Gender
F      135809
M      414259
Name: count, dtype: int64
```

```
In [ ]: #age count sorting in ascending order
df1['Age'].value_counts(ascending=True)
```

```
Out[ ]: Age
0-17      15102
55+       21504
51-55     38501
46-50     45701
18-25     99660
36-45     110013
26-35     219587
Name: count, dtype: int64
```

```
In [ ]: # age count sorting in decending order
df1['Age'].value_counts(ascending=False)
```



```
Out[ ]: Age
26-35    219587
36-45    110013
18-25     99660
46-50     45701
51-55     38501
55+       21504
0-17      15102
Name: count, dtype: int64
```

```
In [ ]: # we replace F for FEMALE and M to be MALE FOR Gender column
df1['Gender'] = df1['Gender'].replace('F', 'Female')
df1['Gender'] = df1['Gender'].replace('M', 'Male')
```

```
In [ ]: df1.head(20)
```

Out[ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City
0	1000001	P00069042	Female	0-17	10	A	
1	1000001	P00248942	Female	0-17	10	A	
2	1000001	P00087842	Female	0-17	10	A	
3	1000001	P00085442	Female	0-17	10	A	
4	1000002	P00285442	Male	55+	16	C	
5	1000003	P00193542	Male	26-35	15	A	
6	1000004	P00184942	Male	46-50	7	B	
7	1000004	P00346142	Male	46-50	7	B	
8	1000004	P0097242	Male	46-50	7	B	
9	1000005	P00274942	Male	26-35	20	A	
10	1000005	P00251242	Male	26-35	20	A	
11	1000005	P00014542	Male	26-35	20	A	
12	1000005	P00031342	Male	26-35	20	A	
13	1000005	P00145042	Male	26-35	20	A	
14	1000006	P00231342	Female	51-55	9	A	
15	1000006	P00190242	Female	51-55	9	A	
16	1000006	P0096642	Female	51-55	9	A	
17	1000006	P00058442	Female	51-55	9	A	
18	1000007	P00036842	Male	36-45	1	B	
19	1000008	P00249542	Male	26-35	12	C	

**GENERATE THE LIST OF USER\_ID WITH CORRESPONDING AGE AND FIND THE TOTAL COUNT OF PURCHASE THAT THEY HAVE DONE**

```
In [ ]: # 1ST GET THE LIST OF USER_ID AND AGE USING TOLIST  
df[['User_ID', 'Age']].values.tolist()
```

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[1000059,	'51-55']
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[1000090, '55+'],
```

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## FINDING DIFFERENT STATISTICAL VALUES OF THE PURCHASE COLUMN

### AGGREGATION IN PANDAS

```
In [69]: import numpy as np
```

```
In [68]: df1['Purchase'].describe()
```

```
Out[68]: count    550068.000000
         mean      9263.968713
         std       5023.065394
         min        12.000000
         25%       5823.000000
         50%       8047.000000
         75%      12054.000000
         max      23961.000000
         Name: Purchase, dtype: float64
```

### TOTAL AMOUNT GENERATED VIA WEBSITE BY SELLING PRODUCT

```
In [ ]: #use np.sum aggregation to get total purchased amount
        df1['Purchase'].aggregate(np.sum)
```

C:\Users\User\AppData\Local\Temp\ipykernel\_57636\2912300007.py:2: FutureWarning: The provided callable <function sum at 0x000001CE264CEAC0> is currently using Series.sum. In a future version of pandas, the provided callable will be used directly. To keep current behavior pass the string "sum" instead.

```
df1['Purchase'].aggregate(np.sum)
```

```
Out[ ]: 5095812742
```

```
In [ ]: # find sum and mean value after doing aggregation over purchase column
        df1['Purchase'].aggregate([np.sum,np.mean])
```

C:\Users\User\AppData\Local\Temp\ipykernel\_57636\702596433.py:2: FutureWarning: The provided callable <function sum at 0x000001CE264CEAC0> is currently using Series.sum. In a future version of pandas, the provided callable will be used directly. To keep current behavior pass the string "sum" instead.

```
df1['Purchase'].aggregate([np.sum,np.mean])
```

C:\Users\User\AppData\Local\Temp\ipykernel\_57636\702596433.py:2: FutureWarning: The provided callable <function mean at 0x000001CE264CFBA0> is currently using Series.mean. In a future version of pandas, the provided callable will be used directly. To keep current behavior pass the string "mean" instead.

```
df1['Purchase'].aggregate([np.sum,np.mean])
```

```
Out[ ]: sum      5.095813e+09
         mean     9.263969e+03
         Name: Purchase, dtype: float64
```

```
In [ ]: #Find mean value for Product_Category_1 ,Product_Category_2,Product_Category_3
        df1[['Product_Category_1','Product_Category_2','Product_Category_3']].aggregate(
```

C:\Users\User\AppData\Local\Temp\ipykernel\_57636\3948570574.py:2: FutureWarning: The provided callable <function mean at 0x000001CE264CFBA0> is currently using Series.mean. In a future version of pandas, the provided callable will be used directly. To keep current behavior pass the string "mean" instead.

```
df1[['Product_Category_1', 'Product_Category_2', 'Product_Category_3']].aggregate([np.mean, np.sum])
```

C:\Users\User\AppData\Local\Temp\ipykernel\_57636\3948570574.py:2: FutureWarning: The provided callable <function sum at 0x000001CE264CEAC0> is currently using Series.sum. In a future version of pandas, the provided callable will be used directly. To keep current behavior pass the string "sum" instead.

```
df1[['Product_Category_1', 'Product_Category_2', 'Product_Category_3']].aggregate([np.mean, np.sum])
```

```
Out[ ]:
```

	Product_Category_1	Product_Category_2	Product_Category_3
mean	5.404270e+00	9.842329e+00	1.266824e+01
sum	2.972716e+06	3.704948e+06	2.113329e+06

**TAG RECORDS 'HIGH FOCUSED' TRANSACTION WHERE PURCHASE AMOUNT HAS BEEN MORE THAN 5000 . REMAINNING CAN BE TAGGED AS ' GENERAL TRANSACTION'**

```
In [ ]: #using apply function to Product_Category_1
df1.Product_Category_1.apply(lambda x:x*10)
```

```
Out[ ]:
```

0	30
1	10
2	120
3	120
4	80
	...
550063	200
550064	200
550065	200
550066	200
550067	200

Name: Product\_Category\_1, Length: 550068, dtype: int64

```
In [ ]: df1.head(10)
```

Out [ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_
--	---------	------------	--------	-----	------------	---------------	-----------------------

0	1000001	P00069042	Female	0-17	10	A	
---	---------	-----------	--------	------	----	---	--

1	1000001	P00248942	Female	0-17	10	A	
---	---------	-----------	--------	------	----	---	--

2	1000001	P00087842	Female	0-17	10	A	
---	---------	-----------	--------	------	----	---	--

3	1000001	P00085442	Female	0-17	10	A	
---	---------	-----------	--------	------	----	---	--

4	1000002	P00285442	Male	55+	16	C	
---	---------	-----------	------	-----	----	---	--

5	1000003	P00193542	Male	26-35	15	A	
---	---------	-----------	------	-------	----	---	--

6	1000004	P00184942	Male	46-50	7	B	
---	---------	-----------	------	-------	---	---	--

7	1000004	P00346142	Male	46-50	7	B	
---	---------	-----------	------	-------	---	---	--

8	1000004	P0097242	Male	46-50	7	B	
---	---------	----------	------	-------	---	---	--

9	1000005	P00274942	Male	26-35	20	A	
---	---------	-----------	------	-------	----	---	--

◀ ▶

In [ ]: *# adding new column 'category' which would help in adding tag for purchase amount*  
`df1['Category']=df1.Purchase.apply(lambda x : 'HIGH FOCUSE' if x>5000 else 'GENERAL TRANSACTION')  
df1.head()`

Out [ ]:

	User_ID	Product_ID	Gender	Age	Occupation	City_Category	Stay_In_Current_City_
--	---------	------------	--------	-----	------------	---------------	-----------------------

0	1000001	P00069042	Female	0-17	10	A	
---	---------	-----------	--------	------	----	---	--

1	1000001	P00248942	Female	0-17	10	A	
---	---------	-----------	--------	------	----	---	--

2	1000001	P00087842	Female	0-17	10	A	
---	---------	-----------	--------	------	----	---	--

3	1000001	P00085442	Female	0-17	10	A	
---	---------	-----------	--------	------	----	---	--

4	1000002	P00285442	Male	55+	16	C	
---	---------	-----------	------	-----	----	---	--

◀ ▶

In [ ]: *# Lets check value for high focused row*  
`df1.Category.value_counts()`

Out [ ]: Category  
HIGH FOCUSE 455145  
GENERAL TRANSACTION 94923  
Name: count, dtype: int64

**BASED ON GENDER, CHECK THE TOTAL PURCHASE AMOUNT AND AVERAGE PURCHASING AMOUNT**

```
In [67]: # use group by on gender column  
df1.groupby('Gender')
```

```
Out[67]: <pandas.core.groupby.generic.DataFrameGroupBy object at 0x000001B12AA5D3D0>
```

```
In [66]: df1.groupby('Gender').groups
```

```
Out[66]: {'F': [0, 1, 2, 3, 14, 15, 16, 17, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39,  
40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 65, 66, 70, 71, 72, 73, 74, 75, 76, 77,  
78, 79, 80, 81, 82, 83, 84, 124, 125, 126, 147, 148, 149, 150, 151, 156, 157, 1  
58, 163, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 219, 222, 223, 248,  
249, 250, 251, 252, 253, 254, 255, 256, 257, 297, 298, 299, 355, 356, 357, 358,  
359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 373, ...], 'M': [4, 5,  
6, 7, 8, 9, 10, 11, 12, 13, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 50, 51,  
52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 67, 68, 69, 85, 86, 87, 88,  
89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106,  
107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122,  
123, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141,  
142, 143, 144, 145, 146, 152, 153, ...]}
```

```
In [65]: #get groups based on gender and age combination  
df1.groupby(['Gender', 'Age']).groups
```



```

Out[65]: {('F', '0-17'): [0, 1, 2, 3, 299, 423, 424, 425, 426, 427, 428, 429, 430, 431,
432, 467, 468, 539, 540, 541, 542, 543, 617, 618, 619, 620, 621, 1150, 1151, 13
04, 1305, 1306, 2905, 2907, 3010, 3715, 3804, 3805, 3806, 3807, 3808, 3835, 383
6, 4551, 4552, 4553, 4554, 4555, 5453, 6431, 6759, 6760, 6761, 6762, 6763, 676
4, 6765, 6766, 6767, 6768, 6769, 6770, 6771, 6772, 6773, 6774, 6775, 6776, 677
7, 6778, 6779, 6780, 6781, 6782, 6783, 6784, 6785, 6786, 6787, 6788, 6789, 679
0, 6791, 6792, 6793, 6794, 6795, 6796, 6797, 6798, 6799, 6800, 6801, 6802, 680
3, 6804, 6805, 6806, 6807, 6808, ...], ('F', '18-25'): [70, 71, 72, 73, 74, 75,
76, 77, 78, 79, 80, 81, 82, 83, 84, 179, 180, 181, 182, 183, 184, 185, 186, 18
7, 188, 222, 223, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 5
07, 508, 509, 547, 548, 549, 550, 625, 910, 911, 912, 913, 914, 1046, 1228, 126
7, 1268, 1269, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 150
0, 1552, 1553, 1554, 1555, 1556, 1665, 1666, 1667, 1668, 1669, 1670, 1671, 167
2, 1673, 1674, 1675, 1676, 1677, 1678, 1822, 1903, 1904, 1905, 1947, 1948, 194
9, 1950, 1951, 1952, 1953, 1954, 1959, ...], ('F', '26-35'): [47, 48, 49, 124,
125, 126, 147, 148, 149, 150, 151, 163, 219, 297, 298, 406, 407, 454, 457, 458,
459, 460, 461, 529, 530, 585, 586, 691, 692, 693, 694, 695, 729, 730, 731, 732,
733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 840, 841, 842, 843, 844, 845,
846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861,
862, 863, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 104
4, 1045, 1085, 1086, 1087, 1088, 1364, 1365, 1369, 1565, 1627, 1628, 1629, 163
0, 1631, 1632, 1633, 1634, 1635, ...], ('F', '36-45'): [29, 30, 31, 32, 33, 34,
35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 65, 66, 156, 157, 158, 373, 37
4, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 531, 532, 5
33, 534, 535, 536, 537, 538, 566, 567, 568, 743, 744, 757, 758, 759, 760, 761,
762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777,
778, 779, 780, 1187, 1188, 1189, 1190, 1191, 1229, 1230, 1231, 1232, 1233, 165
2, 1653, 1741, 1770, 1771, 1772, 1773, 1774, 2197, 2198, 2199, 2200, 2201, 220
2, 2203, ...], ('F', '46-50'): [248, 249, 250, 251, 252, 253, 254, 255, 256, 25
7, 414, 415, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 472, 473, 474, 6
54, 655, 656, 657, 658, 717, 718, 719, 720, 721, 722, 723, 724, 725, 879, 880,
881, 895, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1095, 1096, 1097, 1098, 109
9, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 111
2, 1113, 1114, 1115, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 143
4, 1435, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 256
0, 2561, 2562, 2563, 2564, 2565, 2566, ...], ('F', '51-55'): [14, 15, 16, 17, 3
55, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 400,
401, 402, 997, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 147
7, 1478, 1479, 1480, 1957, 1958, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 199
0, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 200
3, 2004, 2005, 2026, 2027, 2028, 2782, 2783, 2784, 3526, 3527, 3528, 3650, 365
1, 3652, 3653, 3654, 3993, 3994, 3995, 3996, 4177, 4178, 4179, 4180, 4755, 490
1, 4902, 4903, 5625, 5626, 5630, 5631, 5632, 5633, 5884, 5885, 5886, 5887, 588
8, 5889, ...], ('F', '55+'): [475, 476, 1961, 1962, 1963, 1964, 1965, 1966, 196
7, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1981, 1982, 213
9, 2140, 2141, 2142, 2227, 2228, 2229, 2230, 2231, 2232, 3123, 3124, 3125, 312
6, 3127, 3128, 3129, 3130, 3131, 3132, 3133, 3134, 3655, 3656, 3657, 3658, 365
9, 3660, 3687, 3688, 3689, 3690, 4693, 5444, 5445, 5446, 5447, 5448, 5449, 545
0, 5451, 5452, 5594, 5595, 5596, 5597, 5732, 5733, 5734, 5735, 5736, 5737, 573
8, 5739, 5740, 5741, 5742, 5743, 5744, 5745, 5765, 5766, 5767, 5768, 5769, 607
7, 6078, 6404, 6405, 6406, 6407, 6408, 6409, 6931, 7780, 7781, 7782, 7783, 822
3, ...], ('M', '0-17'): [85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 865, 8
66, 867, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 224
7, 2248, 2249, 2250, 2251, 3014, 3015, 3016, 3017, 3018, 3568, 3569, 3570, 357
1, 4375, 4526, 4527, 4528, 4529, 4530, 4531, 4532, 4647, 4648, 4649, 4650, 465
1, 4652, 4653, 4654, 4655, 4656, 4698, 4699, 4771, 5059, 5060, 5061, 5062, 506
3, 5064, 5065, 5066, 5352, 5361, 5362, 5435, 5436, 5437, 5438, 5439, 5440, 544
1, 5624, 5725, 5821, 5822, 5823, 5824, 5919, 5920, 5921, 5922, 5923, 5924, 592
5, 6032, 6033, 6112, 6113, 6114, 6115, 6520, 6521, ...], ('M', '18-25'): [97, 9
8, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 127, 128, 12

```

```
9, 220, 221, 258, 259, 260, 261, 262, 263, 291, 292, 293, 294, 295, 296, 300, 301, 302, 303, 339, 340, 341, 388, 389, 390, 391, 392, 403, 404, 405, 408, 409, 416, 417, 418, 419, 420, 438, 439, 440, 462, 463, 464, 465, 466, 583, 584, 652, 653, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 726, 727, 728, 750, 751, 752, 753, ...], ('M', '26-35'): [5, 9, 10, 11, 12, 13, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 50, 51, 56, 57, 58, 59, 60, 61, 62, 63, 64, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, ...], ('M', '36-45'): [18, 55, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 152, 153, 154, 155, 335, 336, 337, 338, 393, 394, 395, 396, 397, 398, 421, 422, 433, 434, 435, 436, 437, 491, 492, 493, 494, 544, 545, 546, 551, 552, 553, 554, 555, 556, 557, 580, 581, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 623, 624, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 830, 831, 832, 833, 834, ...], ('M', '46-50'): [6, 7, 8, 52, 53, 54, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 189, 190, 191, 192, 193, 194, 195, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 527, 528, 558, 559, 560, 561, 562, 563, 564, 565, 569, 570, 571, 572, 573, 574, 576, 577, 578, 646, 647, 648, 649, 650, 651, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 1057, 1058, 1089, 1090, 1091, 1307, 1308, 1309, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, ...], ('M', '51-55'): [67, 68, 69, 333, 334, 370, 371, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 868, 869, 870, 871, 1047, 1048, 1049, 1050, 1486, 1487, 1488, 1489, 1503, 1504, 1505, 1506, 1681, 1682, 1683, 1738, 1739, 1740, 1775, 1776, 1777, 1778, 1779, 1780, 1781, 1782, 1815, 1816, 1817, 1818, 1819, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2124, 2175, ...], ('M', '55+'): [4, 159, 160, 161, 162, 451, 452, 453, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 645, 659, 893, 894, 1051, 1052, 1053, 1054, 1116, 1117, 1118, 1119, 1559, 1560, 1792, 1793, 1794, 1795, 1796, 1797, 1798, 1799, 1800, 1801, 1802, 1803, 1804, 1805, 1806, 1978, 1979, 1980, 2016, 2017, 2018, 2096, 2097, 2322, 2510, 2614, 2615, 2766, 2767, 2768, 2769, 2770, 2771, 2793, 2794, 2795, 2796, 2797, 2798, 2799, 3011, 3478, 3837, 3838, 3839, 3840, 3841, 3842, 3843, 3844, 3845, 4175, 4176, 4423, 4424, 4425, 4426, 4694, 4695, 4696, 5052, 5053, 5083, 5084, ...]]}
```

In [ ]: